

Health Consultation

KERR-MCGEE (RESIDENTIAL AREAS)

WEST CHICAGO, DUPAGE COUNTY, ILLINOIS

EPA FACILITY ID: ILD980824015

APRIL 25, 2003

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES

Public Health Service

Agency for Toxic Substances and Disease Registry

Division of Health Assessment and Consultation

Atlanta, Georgia 30333

Health Consultation: A Note of Explanation

An ATSDR health consultation is a verbal or written response from ATSDR to a specific request for information about health risks related to a specific site, a chemical release, or the presence of hazardous material. In order to prevent or mitigate exposures, a consultation may lead to specific actions, such as restricting use of or replacing water supplies; intensifying environmental sampling; restricting site access; or removing the contaminated material.

In addition, consultations may recommend additional public health actions, such as conducting health surveillance activities to evaluate exposure or trends in adverse health outcomes; conducting biological indicators of exposure studies to assess exposure; and providing health education for health care providers and community members. This concludes the health consultation process for this site, unless additional information is obtained by ATSDR which, in the Agency's opinion, indicates a need to revise or append the conclusions previously issued.

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HEALTH CONSULTATION

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WEST CHICAGO, DUPAGE COUNTY, ILLINOIS

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Prepared by:

**Illinois Department of Public Health
Under a Cooperative Agreement with the
Agency for Toxic Substances and Disease Registry**

Purpose

The Agency for Toxic Substances and Disease Registry (ATSDR) requested that the Illinois Department of Public Health (IDPH) prepare a health consultation for the Kerr-McGee Residential Areas of the Kerr-McGee site in West Chicago, Illinois. This document updates the status of the site since the release of the 1994 public health assessment and evaluates the current status of the Residential Areas.

Background and Statement of Issues

The Kerr-McGee Residential Areas are located in West Chicago, DuPage County, Illinois. Tailings from Kerr-McGee were used as fill material in residential areas in and around West Chicago. In some cases, the same trucks were used to carry tailings and topsoil, causing contamination of gardens and yards that did not receive actual tailings. Some foundations were constructed of concrete that had been mixed with the tailings.

In November 1994, ATSDR released a public health assessment for the Kerr-McGee Radiation Areas, which included the Residential Areas, Kress Creek, Reed-Keppler Park, and the Sewage Treatment Plant. The report concluded that the Residential Areas posed a public health hazard and made the following key recommendations:

- Action should be taken to reduce public exposure in residential areas that still have tailings, including properties along Kress Creek and the West Branch of the DuPage River. Highest priority should be given to homes with tailings adjacent to their foundations or under them (e.g., in crawlspaces). If no permanent solution is available, interim measures should be taken.
- Radon levels should be measured in all houses with tailings next to their foundations, and follow-up radon measurements should be performed after remediation, including the 11 homes originally tested.
- In the various environmental media, the presence and concentrations of other chemicals used by the Lindsay Light and Chemical Company, American Potash and Chemical Corporation, and/or Kerr-McGee should be assessed, including lead (IDPH, 1994).

In November 1994, the U.S. Environmental Protection Agency (USEPA) issued a Unilateral Administrative Order requiring the Kerr-McGee Company to begin clean up of the Residential Areas. From 1994 to 1996, USEPA measured the following:

- gamma radiation with hand-held instruments at 1,355 residential properties,
- gamma radiation inside residences,
- airborne radon-220 and radon-222 concentrations in residences with elevated gamma radiation levels inside or along foundations,

- radiation in boreholes,
- radioactive element concentrations in soil, and
- gamma radiation, using a specially-equipped van to screen residential properties outside the primary study area (USEPA 1997b).

In 1998, USEPA expanded its study to include additional areas around West Chicago (USEPA 1999). As of July 31, 2002, the study area had 2,173 properties, of which 2,168 had been tested. Of these 2,168 properties, 678 (31%) were found to be contaminated. Kerr-McGee completed clean up of 668 of these properties, leaving 10 with contamination. Six of those 10 remaining contaminated properties were along Kress Creek, and contamination was isolated along the creek. These 10 properties will be remediated during the Kress Creek remediation. In addition to these 10 properties, four other properties with known contamination remain to be tested and remediated, for a total of 14 properties.

As of July 31, 2002, Kerr-McGee had removed a total of 113,248 cubic yards of contaminated material from the Residential Areas, including removal of contaminated soil near West Chicago Middle School and West Chicago Community High School. Bolles Opera House, a former Kerr-McGee laboratory building, was contaminated with radioactive elements and mercury. The building was demolished after repeated clean-up efforts left the building structurally unsound (Illinois Department of Nuclear Safety, 1999).

The City of West Chicago was concerned that some of the 116 properties remediated by Kerr-McGee in the mid-1980s might still have buried contamination exceeding the USEPA clean-up levels. This contamination might not be detectable at the surface because it is covered by clean soil. USEPA is comparing old clean-up records for these properties with current clean-up records to see if sub-surface contamination is likely.

Discussion

Chemicals of Interest

IDPH compared the maximum level of each contaminant detected during environmental sampling with appropriate screening comparison values to select contaminants for further evaluation for both carcinogenic and noncarcinogenic health effects. Chemicals that exceeded comparison values were selected for further evaluation. A detailed discussion of each of the comparison values used is provided in Attachment 1.

The comparison values are used to screen for contaminants that should be evaluated further and do not represent thresholds of toxicity. Though some of these chemicals might exist at levels greater than the comparison values, the chemicals can only affect someone who is actually exposed at sufficient doses to cause adverse health effects. The amount of the contaminant, as well as the duration of exposure, route of exposure, and the health status of exposed individuals are important factors in determining the potential for adverse health effects.

Air

The 1994 public health assessment described past radon monitoring in homes with tailings along foundations. Two homes were found to have elevated radon concentrations. From 1994 to 1996, USEPA measured airborne radon-220 and radon-222 concentrations in 98 residences (USEPA 1997b). The selected homes had elevated gamma radiation levels along foundations or indoors; however, elevated levels of radon-220 or radon-222 were not found in these residences.

Groundwater

No radioactive contamination was detected in private wells near the site. Several West Chicago municipal wells draw water from a deep aquifer, which has elevated concentrations of naturally-occurring radium. The 1994 public health assessment discussed elevated concentrations of radium in the West Chicago municipal water supply. From 1994 through 2000, samples from the distribution system of the West Chicago municipal water supply contained 0.019 to 0.63 becquerels per liter (Bq/L) of radium (USEPA 1998, USEPA 1997a, USEPA 1996, USEPA 1995, USEPA 1994). USEPA has established a maximum contaminant level for radium in public water supplies of 0.19 Bq/L. The city is developing a facility to remove radium from the municipal water supply, which is expected to be completed in 2004 (City of West Chicago, 2002).

Soil

From 1994–1996, USEPA found that the average level of total radioactive elements in composite residential soil samples was 0.27 becquerels per gram (Bq/g). USEPA (1997b) found an average background radium concentration of 0.081 Bq/g, and their cleanup level was 0.27 Bq/g (0.19 Bq/g more than background levels). Contaminants in soil might have been higher before the mid-1980s clean-up activities.

The 161 residential soil samples taken also were analyzed for barium, chromium, and lead, which prior studies had found to be elevated in some of the tailings. No elevated levels of metals were found in any of the samples tested.

Exposure Evaluation

IDPH evaluates the environmental and human components that lead to exposure to determine whether nearby residents are exposed to contaminants migrating from a site. A contaminant can affect people only if they are exposed to sufficient levels for a sufficient period of time.

Exposure pathways are either completed or potential. A completed exposure pathway includes all of the following components:

- a source of contamination,
- transport of the contaminant in one or more of the environmental media (e.g., water, air, soil),

- a point of contact with the contaminant,
- a route of exposure, and
- an exposed population.

A completed exposure pathway must exist for exposure to occur. Conversely, a potential exposure pathway lacks one or more of these components.

The emission of alpha, beta, and gamma radiation depends on the type of radionuclide involved. Some radionuclides emit only one type of radiation, but others emit more than one type. The emissions of some radionuclides have more energy and can do more damage to the body than others. Shorter-lasting radionuclides emit more radiation in a given amount of time than longer-lasting radionuclides (BEIR V, 1990).

Radiation spreads in all directions from a source, and radiation exposure depends on time (exposure duration), distance from a source, and extent of shielding. The intensity of radiation decreases as the distance between a person and the source increases. Alpha and beta particles cannot travel far through the air, so exposure to them requires that a radionuclide be ingested, inhaled, or come near the skin or come into contact with the skin. Some alpha particles and many beta particles can penetrate the skin, but others cannot. Gamma radiation can travel easily through low-density materials, such as air, and it can pass through the body.

Everyone is exposed to background levels of alpha, beta, and gamma radiation from naturally-occurring radionuclides in the environment. People also are exposed to radiation through human-generated sources, mainly medical in nature. People who receive repeated x-rays or radiation therapy are exposed to more radiation than most people (Hobbs, 1986).

Contamination has been removed from most of the Kerr-McGee Residential Areas, eliminating present and future exposure. Consequently, most exposures occurred in the past. Currently, only 10 residential properties have contamination that has not been remediated. For the six properties along Kress Creek, the contamination along the creek is likely to result in negligible exposure because the contamination was isolated along the creek. The contaminated area will be removed during the Kress Creek remediation. An additional five properties have not been tested and are potentially contaminated.

USEPA (1997b) considers exposure to gamma radiation from radionuclides in soil to be the primary exposure pathway for the Kerr-McGee Residential Areas.

On-site workers might come into contact with contaminated soil (in the past, present, or future), particularly if the workers perform excavations. This warrants the use of personal protective equipment by remediation workers.

Residential soil has been almost entirely remediated. Kerr-McGee has completed the cleanup of 668 residential properties, leaving 10 with contamination. Six of these 10 remaining properties

are along Kress Creek. After these properties are remediated, the exposure is not expected to cause adverse health effects.

Toxicological Evaluation

Thorium

All people are exposed to small quantities of thorium, which occur naturally in air, food, and water. People absorb only about 0.02 percent of ingested thorium, and inhalation accounts for 2/3 of the body burden of exposed workers. After absorption, thorium oxides and hydroxides are retained by the body for years, but other thorium compounds remain in the body for weeks. The Kerr-McGee factory produced thorium nitrate and thorium oxide. Thorium accumulates in bone and in the tracheobronchial lymph nodes. Thorium-232 and thorium-230 are long-lived and emit alpha particles. Thorium-228 is a short-lived alpha emitter, and thorium-234 is a short-lived beta emitter. Very little data exist on the human health effects of thorium after inhalation, oral, or skin exposure. After inhalation, studies have found an increased incidence of respiratory diseases, as well as blood forming tissue, lung, lymphatic, and pancreatic cancers in humans.

Gamma Radiation

ATSDR has established an MRL of 1.0 mSv/yr (100 mrem/yr) above background for chronic-duration external ionizing radiation exposure (365 days or more). No individual studies have been identified that could be used to base a chronic-duration external exposure MRL that did not result in a cancer-producing end point. However, BEIR V (1990) reports that the average annual effective dose to the U.S. population is 3.6 mSv/yr. A total annual effective dose equivalent of 3.6 mSv (360 mrem)/year to members of the U.S. population is obtained mainly by naturally-occurring radiation from external sources, medical uses of radiation, and radiation from consumer products. Since this annual dose of 3.6 mSv/yr has not been associated with adverse health effects or increases in the incidences of any type of cancers in humans or other animals, the 3.6 mSv/yr is considered a NOAEL for purposes of MRL derivation. An uncertainty factor of 3 (for human variability) was applied to the NOAEL of 3.6 mSv/yr to derive the MRL of 1.0 mSv/yr (ATSDR 1999).

In the Final Public Health Assessment for the Kerr-McGee Residential Areas (ATSDR 1994), it was reported that the homes were remediated to below 1.0 mSv/yr (100 mrem/yr) above background. Since gamma radiation levels were below ATSDR's MRL of 1.0 mSv/yr it is not expected that there would be any adverse health impact from ionizing radiation.

The 1994 public health assessment on the Kerr-McGee Radiation Areas discussed past surveys of gamma radiation in the Residential Areas, where gamma exposure was most likely at properties with tailings along the foundations. Some residents within 200 feet of the Kerr-McGee facility fence line also have been exposed to elevated gamma radiation levels (USEPA 1997b). The ongoing site remediation should be reducing gamma radiation to background levels. The Illinois

Department of Nuclear Safety expects the cleanup of the Kerr-McGee facility to be completed in 2003 (IDNS 2002).

Child Health Considerations

IDPH recognizes that children are especially sensitive to some contaminants. Children living near the site might have been exposed to gamma radiation in the past. Currently, the properties that have been remediated would not result in adverse health effects in children. In residential areas that have not been remediated, contact with contaminated soil should be avoided.

Conclusions

In the past, the Kerr-McGee Residential Areas were a public health hazard. Exposure was most likely at residences with tailings along foundations and residences within 200 feet of the Kerr-McGee facility.

Currently, the Kerr-McGee Residential Areas pose no apparent public health hazard because almost all of the properties have been remediated, resulting in no further expected exposure. For properties that have not been remediated, exposure to gamma radiation at elevated levels could still be possible, but is not sufficient to cause any adverse health effects. For the average resident at these properties, exposure to gamma radiation would be mainly from external sources, such as soil.

Recommendations and Public Health Action Plan

IDPH recommends the following:

- USEPA should continue to try to secure accesses to examine the four remaining untested properties in the study area.
- USEPA should continue to have Kerr-McGee remediate the remaining residential properties with known contamination.

Preparer of Report

Thomas A. Baughman, Ph.D.
Environmental Toxicologist
Illinois Department of Public Health

Reviewers of Report

Michael D. Brooks, CHP
Senior Health Physicist
Agency for Toxic Substances and Disease Registry

W. Allen Robison, Ph.D.
Toxicologist
Agency for Toxic Substances and Disease Registry

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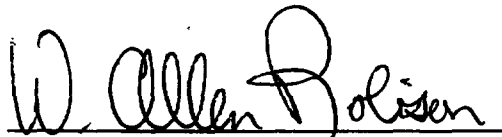
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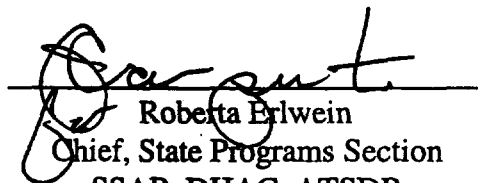
Certification

This Kerr-McGee Residential Areas health consultation was prepared by the Illinois Department of Public Health under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR). It is in accordance with approved methodology and procedures existing at the time the health consultation was begun.



W. Allen Robison
Technical Project Officer
Superfund Site Assessment Branch (SAAB)
Division of Health Assessment and Consultation (DAC)
ATSDR

The Division of Health Assessment and Consultation, ATSDR, has reviewed this health consultation and concurs with its findings.



Roberta Erlwein
Chief, State Programs Section
SSAB, DHAC, ATSDR

Attachment 1

Comparison Values Used in Screening Contaminants for Further Evaluation

Environmental media evaluation guides (EMEGs) are developed for chemicals on the basis of their toxicity, frequency of occurrence at National Priorities List (NPL) sites, and potential for human exposure. They are derived to protect the most sensitive members of the populations and are not action levels, but rather comparison values. They do not consider carcinogenic effects, chemical interactions, multiple-route exposures, or other media-specific routes of exposure.

Reference dose media evaluation guides (RMEGs) are another type of comparison value derived to protect the most sensitive members of the population. RMEGs do not consider carcinogenic effects, chemical interactions, multiple-route exposure, or other media-specific routes of exposure, and are very conservative concentration values designed to protect sensitive members of the population.

Cancer risk evaluation guides (CREGs) are estimated contaminant concentrations that are based on a probability of 1 excess cancer in 1 million persons exposed to a chemical over a lifetime (70 years). CREGs also are extremely conservative values designed to protect sensitive members of the population.

Maximum contaminant levels (MCLs) have been established by USEPA for public water supplies to reduce the chances of adverse health effects from contaminated drinking water. These standards are well below levels for which health effects have been observed. MCLs also take into account the financial feasibility of achieving specific contaminant levels. MCLs are enforceable limits that public water supplies must meet.

Lifetime health advisories for drinking water (LTHAs) have been established by USEPA for drinking water. LTHAs are the concentration of a chemical in drinking water that is not expected to cause any adverse noncarcinogenic health effects over a lifetime (70 years) of exposure. LTHAs are conservative values that incorporate a margin of safety.